

Storm Water Monitoring Program

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**Environmental Services Group
Lawrence Berkeley National Laboratory
Berkeley, California**

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1.0 INTRODUCTION

1.1 General

The Storm Water Monitoring Program (SWMP) constitutes one component of the requirements of the NPDES General Permit for Storm Water Discharges Associated with Industrial Activities as promulgated and administered by the California State Water Resources Control Board (SWRCB) and the San Francisco Bay Regional Water Quality Control Board (RWQCB or Regional Board). It represents the specific plan and procedures Lawrence Berkeley National Laboratory (Berkeley Lab) will implement in order to monitor its storm water discharge for hazardous constituents, and, together with the Storm Water Pollution Prevention Plan (SWPPP), demonstrates Berkeley Lab's compliance with the requirements of the state general permit. This program has been prepared in accordance with the requirements of 40 CFR 122 and the United States Department of Energy (DOE) Order No. 5400.1, "General Environmental Protection Program."

As a DOE facility, Berkeley Lab is subject to applicable orders issued by the United States Department of Energy and defined by the UC Contract, Appendix G, including portions of DOE 5400.1, General Environmental Protection Program, and DOE/EH-0173T, Environmental Regulatory Guide for Radiological Effluent Monitoring and Environmental Surveillance. The latter both incorporates and expands on requirements embodied in the former. To ensure that Berkeley Lab research activities are carried out in compliance with both DOE orders and regulatory requirements, Berkeley Lab maintains a complex program of monitoring of the workplace, effluents, and the environment. Among other information, the various kinds of monitoring undertaken and the results are detailed in the annual Site Environmental Report.

DOE orders are directives rather than regulations enforceable by civil or criminal penalties. Berkeley Lab adheres to them pursuant to Contract No. DE-AC03-76SF00098, Appendix G, between DOE and the University of California, which operates Berkeley Lab for DOE.

1.1.1 Berkeley Lab Organization

Within the Environment, Health, and Safety Division at Berkeley Lab, the Environmental Services Group (ESG) has general responsibility for regulatory compliance oversight with federal, state, and local laws, regulations, and orders, and prepares necessary permits, plans, and reports documenting compliance as required. Within ESG, the Water Quality Program is charged with responding to the requirements of the General Permit, and will maintain and update the SWMP.

1.2 Regulatory Framework

1.2.1 Federal Requirements

The Clean Water Act, enacted by Congress in 1972 as an amendment to the Federal Water Pollution Control Act, gave the EPA authority to regulate the discharge of any pollutant from a point source to navigable waters by means of a permit system called the National Pollutant Discharge Elimination System (NPDES). Using this authority, EPA has up to now concentrated mainly on regulating discharges from municipal treatment plants and the process waters from industrial facilities. However, several nationwide studies conducted in recent years have consistently shown urban runoff

to be a leading cause of water quality impairment to the nation's waterways and wetlands. Surveys indicated that such pollution from diffuse sources — including urban runoff, agricultural runoff, construction-site discharges, illegal dumping, and illicit connections to storm sewers — contained both organic and inorganic pollutants and included heavy metals, cyanides, pesticides, construction chemicals, solid wastes, and oil and grease.

Accordingly, the Water Quality Act of 1987 amended the Clean Water Act and provided the impetus for EPA to change its focus and begin regulating storm water discharges under the NPDES program. On November 16, 1990, the EPA published a final rule relating to permitting requirements for storm water discharges for three categories: (1) medium (with a population of between 100,000 and 250,000) municipal separate storm water systems, (2) large (with a population over 250,000) municipal separate storm water systems, (3) discharges associated with industrial activity. Both "storm water discharge" and "industrial activity" are defined in the rules.

The EPA estimates that about 100,000 industrial facilities will be affected by the storm water regulations. The burden is on each facility to decide whether or not it must apply for a permit. If a facility has a Standard Industrial Classification (SIC) code that is within one of the regulated categories, or fits the description of a category, it probably is subject to storm water permitting. If a facility further has a storm water discharge from any conveyance used for collecting and conveying storm water, and that discharge goes either to U.S. waters or to a separate storm water system, it will be required to permit that discharge under the storm water regulations.

EPA devised a strategy whereby there are three types of storm water permits (general, group, and individual), and many states that have authorized NPDES programs have issued their own general permits to cover the majority of their industrial dischargers.

1.2.2 State Requirements

The State of California has an authorized NPDES program, and early on the SWRCB announced its intent to issue a general permit, which would cover the majority of the facilities engaged in industrial activity in the state. On November 19, 1991, the state did adopt such a general permit. The first requirement for this permit was the submittal of a Notice of Intent (NOI) between January 15 and March 30, 1992. Other requirements included the elimination of non-storm water discharges to storm water systems, the development of a Storm Water Pollution Prevention Plan (SWPPP), and the development of an SWMP, all of which Berkeley Lab has completed.

On April 17, 1997, the SWRCB re-issued the General Permit. It contained many changes, several of which will impact Berkeley Lab's program. This revision of the SWMP has been undertaken to address the required changes and incorporate them into the program.

This SWMP is therefore written to comply with the requirements of the existing General Permit. It is a plan which is not submitted to an agency, but rather must be kept on the site and available for inspection by an administering agency. Within the general framework of the permit requirements and provisions, each participating facility will develop site-specific plans tailored to the needs and circumstances of its own site and operations.

1.2.3 Applicability to Berkeley Lab

Several criteria exist to determine whether a facility's operations must be permitted under the storm water NPDES regulations. The General Permit refers to categories detailed at 40 CFR 122.26 (b)(14). Berkeley Lab fits into two of these categories: facilities subject to toxic pollutant effluent standards (40 CFR Subchapter N), and hazardous waste treatment, storage, or disposal facilities. Because of metal finishing operations at Buildings 25 and 77 (SIC code 3499), Berkeley Lab is subject to toxic pollutant effluent standards, which are categorized as Category 1 discharges under the NPDES General Permit applicability criteria. Additionally, the operation of a hazardous waste treatment and storage facility (SIC code 4953) also subjects Berkeley Lab to the General Permit.

A major criterion in determining whether a facility is engaged in industrial activity is its SIC code. Although Berkeley Lab's general classification is 8733, Noncommercial Research Organization, several of the secondary SIC codes under which Berkeley Lab is classified would require Berkeley Lab to be covered under the General Permit. The activities include gasoline dispensing (5541), transportation (4789), and car washing (7542). Accordingly, Berkeley Lab submitted an NOI in March of 1992 and embarked on a program of identifying and eliminating all non-storm water discharges to storm water systems. This program was successfully completed in March of 1995. An SWPPP and an SWMP have been in place since October 1, 1992. Current revisions of these plans are the guiding documents for the facility's compliance with storm water permitting regulations.

Based upon a rationale as detailed in Section 2.0 of this document, Berkeley Lab has decided upon a certain monitoring program, which it desires to implement in the interest of characterizing its own facility and responsibly managing its storm water in the spirit of the Clean Water Act. The details of this plan are given in the following sections of this SWMP. Please note that off-site locations where Berkeley Lab activities are conducted (including parts of several buildings on the UC campus and three off-site leased buildings, 903, 937, and 941) have not been included in this plan, 1) because they are not physically contiguous to the property addressed in this plan, and 2) because they do not contain any industrial activity or have any hazardous materials exposed to storm water.

1.3 Monitoring Program Objectives

Berkeley Lab has designed this SWMP to be responsive to the objectives of the general permit for a monitoring program. These are:

- To demonstrate compliance with the permit;
- To demonstrate compliance in the implementation of the SWPPP;
- To measure the effectiveness of Best Management Practices in removing pollutants from industrial storm water discharge.

The purpose of the SWMP is thus to produce reliable, representative, defensible, and sufficient data in order to assess the quality of Berkeley Lab's storm water discharge. This will enable Berkeley Lab to demonstrate permit compliance by meeting discharge prohibitions, effluent limitations, and receiving water limitations as stated in the general permit. Discharge prohibitions include unauthorized non-storm water discharges, anything in excess of 40 CFR Subchapter N numeric effluent limitations, and discharges of storm water containing hazardous substances in excess of reportable quantities established at 40 CFR 117.3 and 40 CFR 302.4. Furthermore, storm water discharges should not adversely impact human health or the environment, or violate applicable standards contained in various state or regional water quality plans. The Regional Board has stated

that any such limits are currently regarded as guidelines rather than causes for enforcement action, as long as BMPs have been implemented that achieve BAT/BCT and a report is made to the RWQCB in accordance with C.3 of the General Permit.

The SWMP will also enable Berkeley Lab to demonstrate implementation and efficacy of the SWPPP and to gauge the effectiveness of Best Management Practices instituted in accordance with the SWPPP. While the SWPPP is a separate document, the measures and practices delineated in it substantially affect the parameters of concern in the monitoring program. As the SWPPP represents at least in part the existing conditions on which the SWMP is predicated, so the SWMP is the means for determining the soundness of the SWPPP.

1.4 Implementation Activities

In order to fulfill the requirements of the general permit for a SWMP, Berkeley Lab will, at a minimum, perform the following activities:

- Conduct visual observations for the presence of unauthorized and authorized non-storm water discharges quarterly. Efforts will normally consist of visual observation of flows, stains, sludges, odors, and other abnormal conditions, and will be recorded on a standard form including date of observations, locations observed, and observations, and any actions taken (see Appendix C).
- Conduct visual observations of the storm water discharge locations during the wet season (October 1 to May 30) for at least one storm event per month that produces significant storm water discharge. "Significant" storm water discharge is defined as a continuous discharge of storm water for a minimum of one hour. Observations will be recorded on a standard form (see Appendix C) and will include floating and suspended materials, oil and grease, discolorations, turbidity, odor, and source of any pollutants. Observation dates, locations observed, observations, and any actions taken to reduce or prevent pollutants in storm water discharges will be recorded. Should there not be a storm event per month which produces significant discharge, or visual observations not be performed due to adverse climatic conditions, this fact will be documented in the record as an exception report and will be made part of the annual monitoring report.
- Collect and analyze samples of storm water discharge of representative quality and quantity from at least two storm events during a wet season that produce significant storm water discharge. Samples will be taken and preserved in accordance with the sampling program detailed in Section 4.0 of this document. Samples will be analyzed for the following parameters: pH, total suspended solids (TSS), specific conductance, and total organic carbon (TOC) or oil and grease, plus toxic chemicals and other pollutants which have a reasonable potential to be present in storm water discharge in significant quantities. Such materials are detailed in Section 2.4 of this document, Rationale for Monitoring Program Parameters. Analysis shall occur for at least two consecutive sampling events. At Berkeley Lab's option and with the approval of the RWQCB, analysis for acute toxicity may be conducted in lieu of chemical-specific analysis. Should the required samples not be collected due to adverse climatic conditions as defined in the permit, this fact will be documented in the record as an exception report and will be made part of the annual monitoring report.

- Calibrate and maintain all monitoring instruments and equipment in accordance with manufacturers' specifications to ensure accurate measurements and to ensure that QA/QC as defined in the environmental monitoring program is followed.
- Train and certify all personnel carrying out observations and/or sampling in accordance with the training program which is described in Section 6.0 of this document.
- Conduct all analyses at a laboratory certified for such analyses by the State Department of Health Services. Berkeley Lab will specify that all analyses must be conducted according to test procedures under 40 CFR 136, unless other procedures have been specified in the general permit or by the Regional Board.
- Retain records of all storm water monitoring information and copies of all required reports, inspections, and certifications for a period of at least five years. Such records are detailed in Section 5.0 of this SWMP, Records and Reports.
- Submit an annual report by July 1 of each year to the Executive Officer of the San Francisco Bay Regional Water Quality Control Board, and, if requested, to a local agency. The contents of this report are detailed in Section 5.0 of this SWMP, Records and Reports. Berkeley Lab will also include sampling results in the annual Site Environmental Report.
- Maintain on the site a copy of this SWMP and make it available upon request to a representative of the Regional Board and/or local agency, which receives the storm water discharge, or DOE.
- Update and amend the SWMP upon any change of conditions as described in this document, or as necessary on the basis of the annual report and program evaluation. Upon notification by the Regional Board or local agency of any deficiencies in the SWMP, Berkeley Lab will submit a time schedule for amending the SWMP to meet requirements to the appropriate agency within 30 days. After making any required changes, Berkeley Lab will provide written certification to the appropriate agency that such changes have been made.
- Institute a quality assurance/quality control program to assure that all elements of the monitoring program are conducted and that all monitoring is conducted by trained personnel. The elements of such a program are detailed in Section 7.0 of this document, QA/QC and Program Evaluation.
- Conduct a program evaluation to ascertain the effectiveness of the monitoring program in achieving its stated objectives (see Section 1.3 above). The elements of such an evaluation are also detailed in Section 7.0 of this document and are included in the annual report.
- Notify the RWQCB of Berkeley Lab's intent to conduct composite sampling rather than grab sampling, as defined in the permit, and to substitute other representative parameters (e.g., whole effluent toxicity) for chemical-specific monitoring, as appropriate.
- Conduct annual site inspections to identify areas contributing to a storm water discharge associated with industrial activity and to evaluate whether measures to reduce pollutant loadings identified in the SWPPP are adequate and properly implemented. Records of the annual site inspections will include the date, the individual who performed the inspections, and any observations, and are included in the annual report.
- Certify, based on the annual site inspections, that the facility is in compliance with the requirements of the General Permit and the SWPPP. Certification will be in accordance with requirements as detailed in Section 5.0 of this SWMP, Records and Reports.

2.0 RATIONALE FOR MONITORING EFFORTS

2.1 Facility Description

Lawrence Berkeley National Laboratory (Berkeley Lab) is a multiprogram national laboratory managed by the University of California for the U.S. Department of Energy (DOE). Berkeley Lab's major role is to conduct basic and applied science research appropriate for an energy research laboratory. Berkeley Lab also supports nationwide university-based research by providing national facilities, including the National Center for Electron Microscopy, three large and several small particle accelerators, the Human Genome Center, a number of radiochemical laboratories, and several large gamma irradiators. Support functions for these operations at Berkeley Lab include handling and storage of hazardous materials, management of hazardous wastes (pre-treatment of wastewaters, storage and/or treatment of hazardous waste in containers and tanks, and packaging and storage of low-level mixed waste), metal finishing, vehicle maintenance, various fabrication and construction activities, and provision of infrastructure and utilities. Normal operating hours for the facility are 8 a.m. to 5 p.m., Monday through Friday.

2.2 Site Description

2.2.1 Location

Berkeley Lab is located in Alameda County in the hills above the University of California campus, approximately three miles east of San Francisco Bay (see Figure 2-1). Most of the site is within the city limits of Berkeley, although the eastern portion (approximately one-quarter of the site) is within the City of Oakland. Berkeley Lab is situated on the generally western-facing slopes of the hills, at elevations ranging from 150 to 330 meters above sea level. The total acreage of this site is 203 acres, of which approximately 110 acres remain undeveloped, with steep slopes and vegetation which lend the area a rural character.

The site currently includes 80 permanent buildings and 108 trailers and temporary structures encompassing 1.75 million gross square feet. Approximately 50% of the site is currently either paved or covered by buildings or structures (see Figure 2-2).

On the northern boundary of the central portion of the Berkeley Lab site, and also spatially above it on the hill slopes, is the UC Berkeley Lawrence Hall of Science, with the Samuel Silver Space Sciences Laboratory, the Mathematical Sciences Research Institute, and a field station for behavioral research with animals beyond that. Also upslope and to the north and west bordering University property is a series of single-family residences that overlook Berkeley Lab. To the east, Berkeley Lab is bounded by undeveloped lands included in the UC Berkeley ecological study area and, across Centennial Drive, the Botanical Garden. Abutting Berkeley Lab to the south and west, and downslope of it, are the University of California and various of its facilities such as student residence halls, and a residential area consisting primarily of multiple- and single-family dwellings and mid-rise apartment buildings.

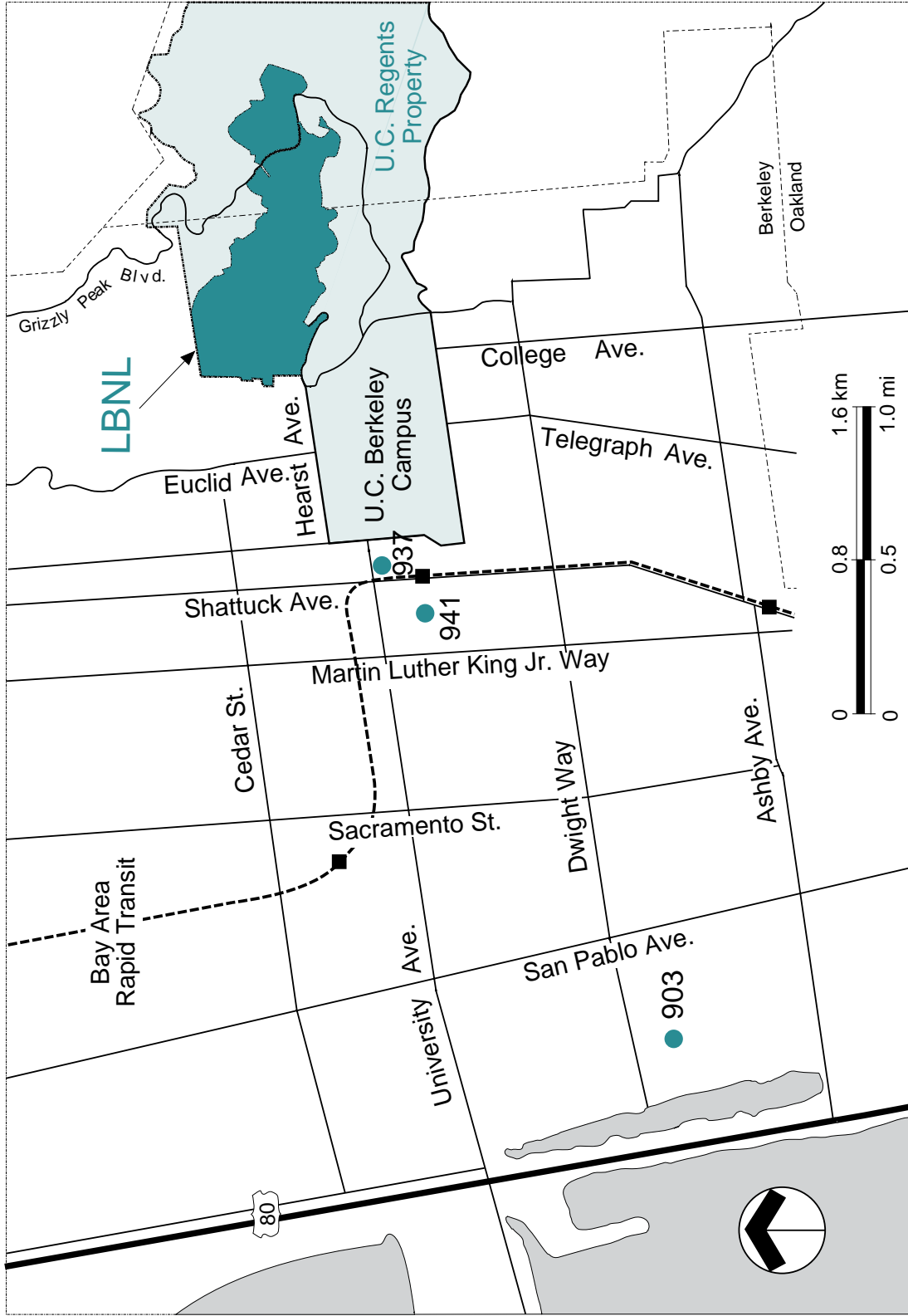


Figure 2-1
Vicinity Map

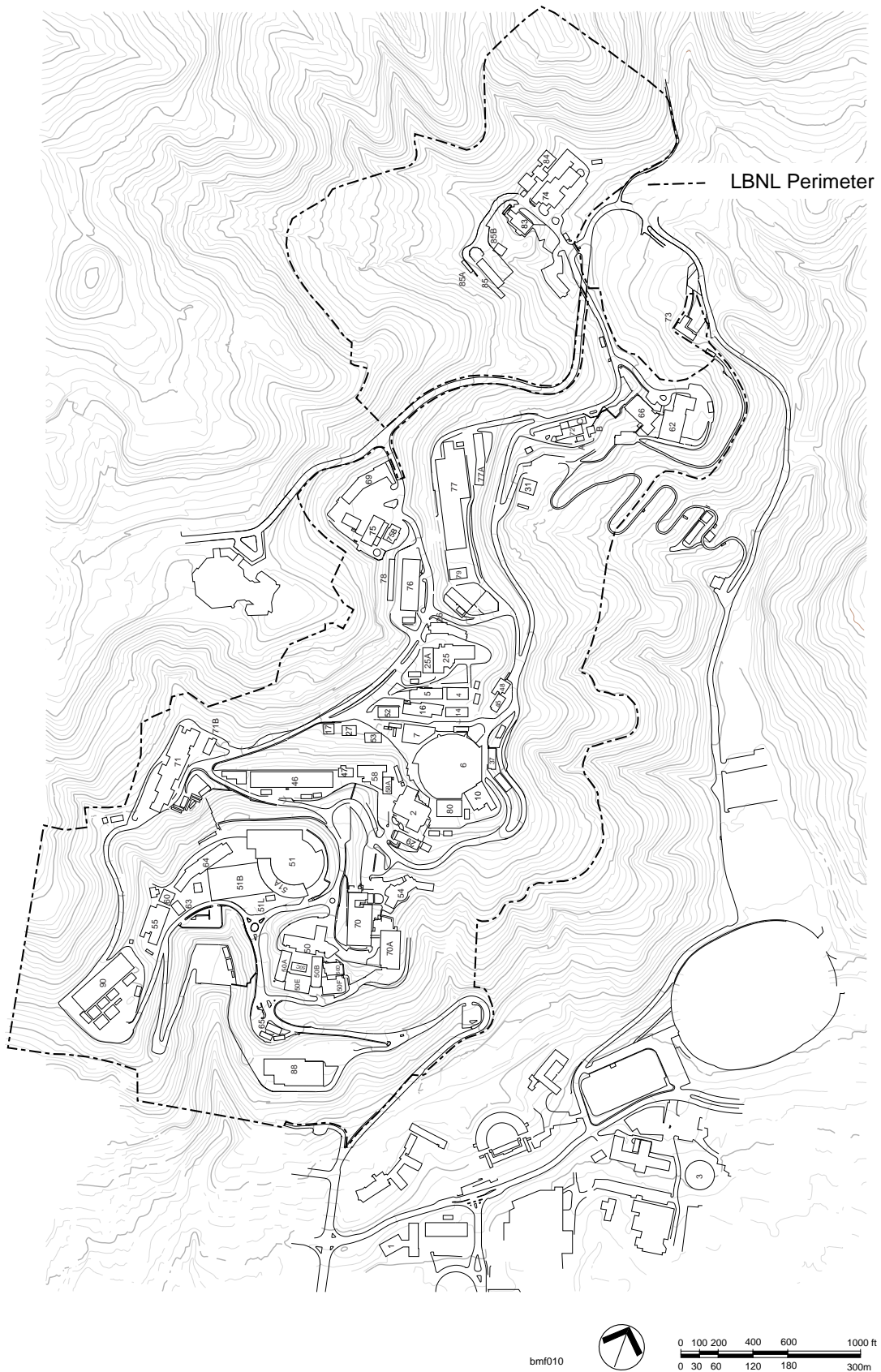


Figure 2-2
Lawrence Berkeley National Laboratory Buildings

Berkeley Lab's location on the eastern shore of San Francisco Bay is usually influenced by maritime air masses from the eastern Pacific Ocean which flow through the Golden Gate. During the spring through autumn months, this flow is usually generated by the temperature differences between the air over the Pacific Ocean and that of the interior valleys of California. Fog often moves on shore during summer afternoons, although rain is uncommon. The winter months are climatologically characterized by cycles of Pacific Ocean storms that bring periods of clouds, wind, and rain. About 95% of the annual average rainfall of 30 inches occurs from October through April, and intensities are seldom greater than one-half inch per hour. Thunderstorms, hail, and snow are extremely rare. Berkeley Lab enjoys a mild, Mediterranean-type climate, with drought years as well as heavy rainfall years.

2.2.2 Site Drainage

Watershed

The topography of the hilly area in which Berkeley Lab is located is characterized by three main canyons with related tributary features. The west-trending Strawberry Canyon lies along the southern border of the property; at its head, it is joined by a north-south trending canyon along the eastern border of the property. Blackberry Canyon, another west-trending feature, drains the central and northern portions of Berkeley Lab. The topography at Berkeley Lab and the surrounding area is shown on Figure 2-3.

Berkeley Lab lies within the Strawberry Creek Watershed, which includes other University of California property, public streets of both Oakland and Berkeley, and private property. Of this portion of the watershed, comprised of 874 acres, approximately one-third lies within the City of Berkeley, while two-thirds lies within the City of Oakland. Two main branches of Strawberry Creek drain the watershed, the north fork and the south fork. The south fork is usually referred to as Strawberry Creek, while the north fork is commonly known as the North Fork.

Strawberry Creek Watershed is divided into five sub-watersheds (see Figure 2-4). That portion called the North Fork (Blackberry Canyon), as it relates to Berkeley Lab, contains 141 acres comprised mostly of steep canyons and hillsides covered with brush, trees, and grass. Within this are Berkeley Lab's buildings, parking lots, pavements, and other improvements, and the upslope buildings, roads, and parking lots belonging to the university.

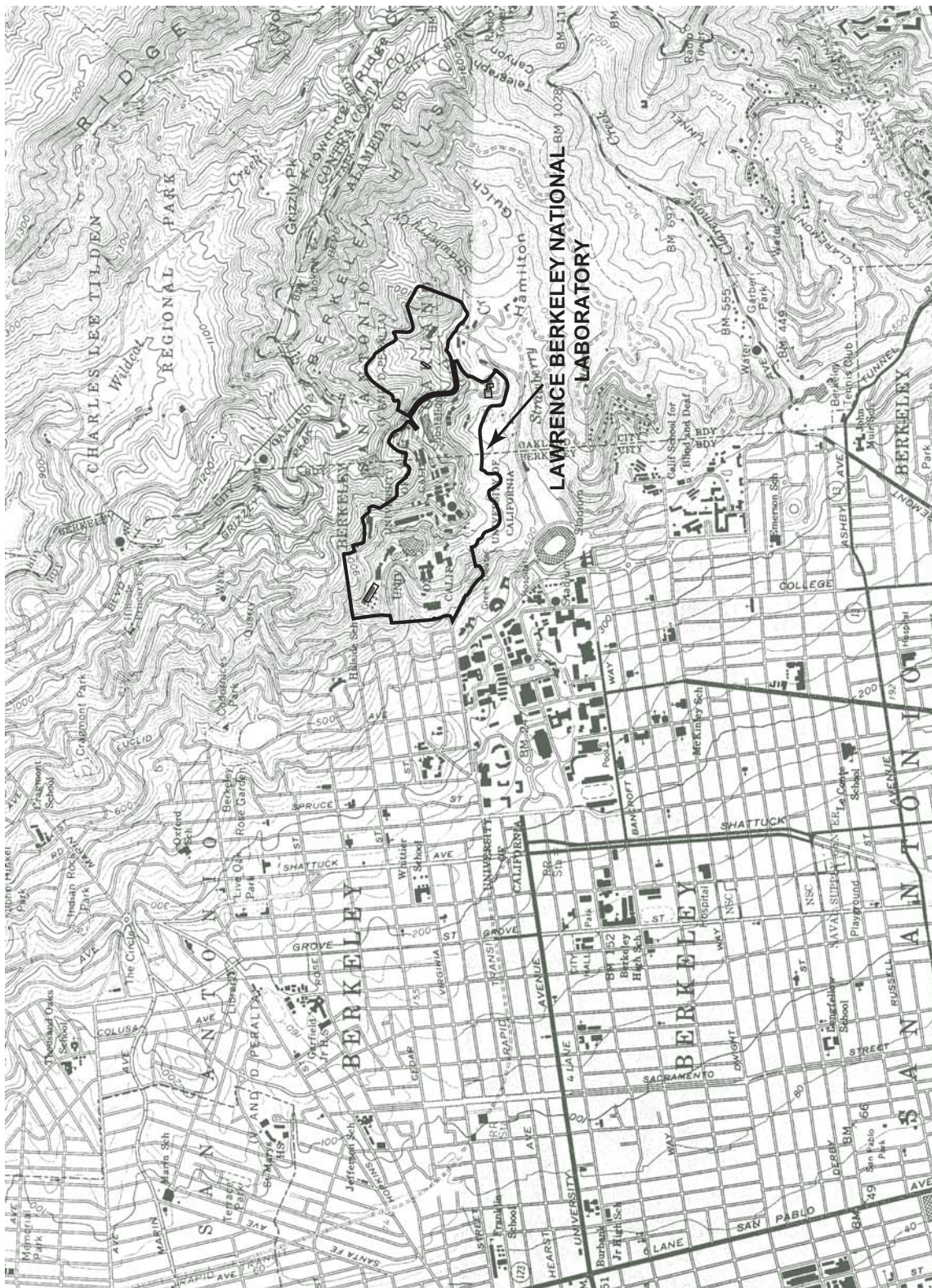
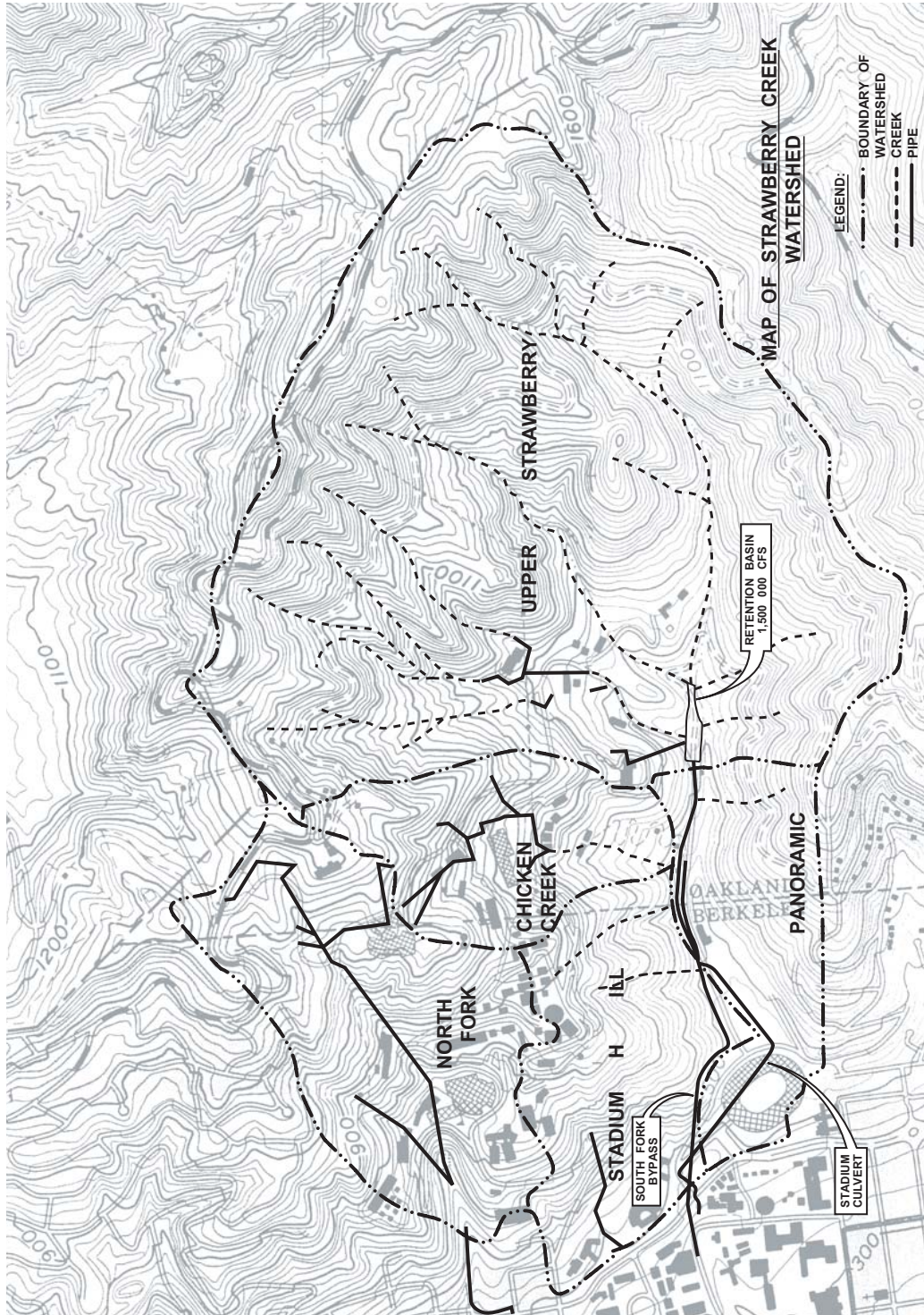


Figure 2-3 Setting and Topography of the LBNL Site



Flow data represent calculated peak flows within the culverts at the points of concentration.

Figure 2-4
Strawberry Creek Watershed

The South Fork (Strawberry Canyon) watershed of Strawberry Creek, as it relates to Berkeley Lab, has a total area of about 733 acres and is further divided into four sub-watersheds as presented in Table 2-1:

Table 2-1
Area in Acres of Strawberry Canyon Watersheds

Watershed	Total Area	Total Developed Area	Berkeley Lab Developed Area
Upper Strawberry Creek	502	14.0	4.0
Chicken Creek	66	12.0	10.0
Panoramic	73	15.4	—
Stadium Hill	92	12.0	7.5

Groundwater

Highly complex groundwater conditions are present at Berkeley Lab. Water table depths vary from 10 to over 90 feet across the site. Year-round springs, annual surface seeps, and variable water levels in observation wells indicate discontinuous and localized aquifers. During the rainy season, groundwater levels increase and cause an increase in hydrostatic pressure and a decrease in slope stability. Consequently, Berkeley Lab has installed an elaborate groundwater detection and drainage system. The drainage system uses both pumped vertical and free-flowing horizontal wells called hydraugers. Discharge from the hydraugers is routinely routed to the storm drainage system, except for the discharge at Buildings 6, 7, 46 and the discharge from some hydraugers to the north and east of Building 51, which have been found to contain low levels of solvents (chlorinated hydrocarbons) from a plume of contamination present in a narrow aquifer formed along the bed of the main branch of the original North Fork of Strawberry Creek. Discharge from these hydraugers is collected and treated by granular activated carbon systems and is subsequently discharged to the sanitary sewer under a permit from the East Bay Municipal Utility District (EBMUD).

Surface Water

Surface water is in part composed of the above-mentioned seeps and springs; one permanent spring is located in the northeastern portion of the site and contributes to the North Fork of Strawberry Creek. Other features of surface water are the stream flows, which vary from nearly dry conditions in the summer, particularly during drought years, to powerful runoff flows during intense winter rains. Both the north and south forks of Strawberry Creek are perennial and are believed to be fed by springs and the hydraugers during the summer; their tributaries are ephemeral, and any flow is generally limited to storm water runoff. Berkeley Lab is not located within a 100-year flood plain.

Storm Drain System

Extensive cut and fill operations and grading of the natural steep slopes have occurred over the history of Berkeley Lab as development of the site has progressed and structures, multi-story buildings, roads, parking lots, and storage areas have been constructed. Natural drainage patterns have been altered, and extensive paving and building have increased runoff during storms, which in turn increased erosion and added to the ever-present danger of landslides.

As a consequence, a storm drain system was designed and installed in the 1960s and currently provides capacity for runoff intensities expected from the 25-year storm (see Figure 2-5). There is some evidence that portions of this system are now of questionable integrity and may, through infiltration, allow discharge of contaminants to surface waters. On the north, draining the North Fork of Strawberry Creek watershed portion of Berkeley Lab and the upper parts of the watershed beyond Berkeley Lab, the system discharges into a 60-inch concrete culvert at the head of Le Conte Avenue in Berkeley. Southerly and easterly portions of Berkeley Lab drain into Chicken Creek, Ten-Inch Creek, Ravine Creek, and Cafeteria Creek, to list the named tributaries, and then into Strawberry Creek. The East Canyon portion of the site drains to Botanical Garden Creek and then into Strawberry Creek.

Strawberry Creek is diverted underground through a culvert and later emerges as a surface stream near the eastern end of the UC campus. The north and south forks of Strawberry Creek later combine at the western end of the campus, approximately 400 feet east of the City of Berkeley's Oxford and Center streets culvert. Runoff from the entire watershed, including the lower campus, is delivered to the entrance of this culvert. The runoff flows through the City of Berkeley's storm drainage system and empties into San Francisco Bay.

2.3 Rationale for Monitoring Locations

Having examined site drainage and conditions as described above, and having monitored under this program since the 1992/93 wet season, Berkeley Lab now concentrates its monitoring efforts on four sampling locations: one influent and three effluent. Figure 2-5 shows all monitoring locations, including the influent locations. Since Berkeley Lab clearly receives runoff from facilities and residences above it in the watershed, it is felt that sampling of the influent location is an important component of the monitoring program and will aid in establishing off-site sources of any contaminants which may be identified. All monitoring locations are further described below.

For the northern and central portion of the site, drained by the North Fork of Strawberry Creek, there is clearly a major influent point and a major effluent point. The previous influent sampling location has been abandoned due to safety considerations, and a replacement location remains to be determined.

The effluent sampling location is shown as StW2 on Figure 2-5. The sampling equipment will be installed downstream of the fence (just off the property) in order to incorporate the discharge from an 18" pipe which enters the stream just beyond the property line. This pipe receives storm runoff from the areas of Buildings 88, 65, 50A, 50B, 50C, 50 D, 50E, and 50F. The North Fork of Strawberry Creek itself at that point receives storm water runoff from the entire rest of the site within its watershed, namely Buildings 90 and attendant trailers, 55, 55A, 60, 63, 56, 64, 51, 51B, 71, 46, 46A, 47, 17, 27, 53, 52, 16, 7, 6, 80, 2, 58, 58A, and portions of 70 and 70A.

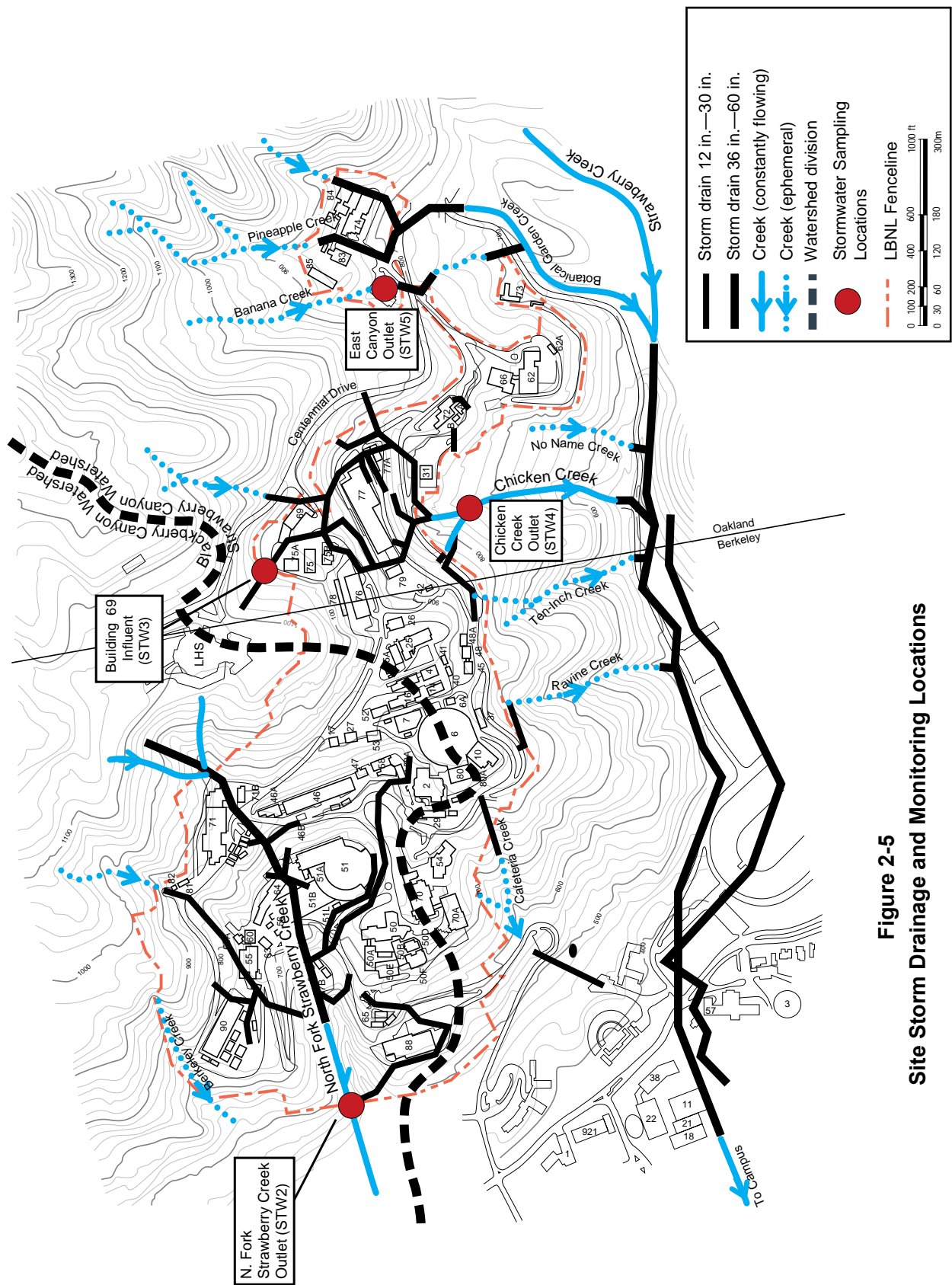


Figure 2-5
Site Storm Drainage and Monitoring Locations

The influent sampling point for the Strawberry Canyon watershed will be the large manhole north of Building 69 (StW3 on Figure 2-5). This manhole receives storm water from the Lawrence Hall of Science, from the hillside above Berkeley Lab, and from off-site road drainage. Although there are minor influent streams in the areas of Building 69 and Buildings 83, 84, 85, and 74, the drainage area on the hillside above them is undeveloped; it is currently not planned to sample these points, since there is no reason to believe that these are a significant source of pollution.

The major outlet for storm water runoff from Berkeley Lab within the Strawberry Canyon watershed has been determined to be a tributary of Strawberry Creek named Chicken Creek. It drains the area which includes Buildings 31, 72, 77, 77A, 69, 75, 75A, 75B, 76, 78, 79, 26, 61, and Grizzly Substation. Site drainage drawings indicate that storm water runoff from portions of Buildings 25, 25A, 4, 5, 40, 41, 43, 45, and 48 is also routed to this discharge. The sampling point at this location (StW4 on Figure 2-5) will be inside the fence line, but just beyond the point where the runoff from Building 31, discharged through a 12" CMP and then an aboveground channel, will enter Chicken Creek.

In the early years of the program, Berkeley Lab also monitored at various points which convey relatively minor amounts of runoff and were believed to contain little potential for contamination (see Revision 0 of this document, 1992, Fig. 2-5). These sites were analyzed for whole effluent toxicity for three years, with no toxicity ever having been established. These locations were then dropped from the program after appropriate notification to the RWQCB and the City of Berkeley.

StW5 came on-line during the fourth quarter of 1996. The reason for adding this site was the construction of a new Hazardous Waste Handling Facility in the East Canyon. Pre-operational baseline monitoring for this facility was performed during 1995 and the first half of 1996; preliminary results of this surveillance were published in the 1995 Site Environmental Report, and full results were made available in a report later in 1996. Although all operations are performed indoors and it is not expected that they will contribute to contamination of Berkeley Lab's storm water discharge, Berkeley Lab monitors this facility because a facility which treats and stores hazardous waste is one of the categories which triggers the need to obtain a storm water discharge permit. The sampling point is on the east side of Cyclotron Road, adjacent to its overcrossing by Centennial Drive, just before the channel goes into a culvert under the road.

Table 2-2 lists the above discharges, the potential sources of contaminants, and the potential contaminants for each discharge. The last two columns of Table 2-2 are a compilation of several past and current investigations into soil, surface water, and groundwater contamination at Berkeley Lab. These include *Preliminary Environmental Investigations at the Lawrence Berkeley National Laboratory*, conducted by Iraj Javandel in 1990, the 1992 *RCRA Facility Assessment* completed by the site Environmental Restoration Program, and the *RCRA Facility Assessment* done by DTSC in 1991. See below under Section 2.4, Rationale for Monitoring Program Parameters, for further details.

Table 2-2

Potential Contaminants and Building Area Sources at Berkeley Lab

Discharge Point	Drainage From Area Of	Function	Potential Area Sources	Potential Contaminants
North Fork of Strawberry Creek (StW2)	Building 88	88-Inch Cyclotron	Waste Accumulation Area Former Drum Storage Area	
	Building 50 Complex	Director's Office, Administrative, Physics, NERSC, Computer Center, MCSD and Nuclear Science, Earth Sciences, Technical Information Department	Former aboveground storage tank	
	Building 64	Accelerator and Fusion Research	Possible spill	Organic solvents, lead, mercury
	Buildings 51 and 51B	Former Bevalac/Bevatron, External Particle Beam Hall	Waste Accumulation Area, former underground storage tank	Diesel
	Building 71	Center for Beam Physics	Former Hazardous Materials Storage Area, Former cooling unit, transformer	Kerosene, alcohol, lubricants, organic solvents Freon 113; PCBs
	Building 46A	Real Time Systems Section	Former gasoline underground storage tank	Gasoline
	Building 27	High Voltage Test Facility and Cable Shop	Waste Accumulation Area	
	Building 52	Magnetic Fusion Energy Laboratory	Former aboveground storage tank	PCBs, gasoline, acetone, alcohol, organic solvents, kerosene, metals
	Building 7	ALS Stores	Former plating shop Former underground storage tank	Acids, caustics, cyanide, metals, solvents, Kerosene, BTEX, PCBs
	Building 58	Accelerator Research and Development	Drum Storage Area, Former underground storage tank	Diala Shell Oil, rinsate
	Building 70A	Nuclear Science, Materials and Chemical Sciences, and Earth Sciences	Former underground storage tank	Diesel
Chicken Creek (StW4)	Building 31	Maintenance Building	Drum Storage Area	
	Building 66	Surface Science and Catalysis Lab	Underground storage tanks	Diesel
	Building 77	Mechanical Shops	Waste Accumulation Area Former Yard Decontamination Area Former Yard Solution Bath Area	Soapy rinse water with oils from cutting fluids and other machine lubricants Acids, caustics, cyanide, copper plating solutions, chromates, metals, TCA, PCE
	Building 77A	Ultra High Vacuum Assembly Facility	Waste Accumulation Area	

Discharge Point	Drainage From Area Of	Function	Potential Area Sources	Potential Contaminants
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Discharge Point	Drainage From Area Of	Function	Potential Area Sources	Potential Contaminants
Chicken Creek (cont.)	Building 75	National Tritium Labeling Facility		Tritium
	Building 75A	Former Hazardous Waste Compactor, Processing and Storage Facility		
	Building 76	Construction and Maintenance/ Automotive Services	Waste Accumulation Areas	
	Building 79	Metal Stores	Drum Storage Area	
	Grizzly Substation	Substation		Transformer Oil
	Building 25	Mechanical Technology	Waste Accumulation Area	
	Building 4	Magnetic Fusion Energy	Former Radioactive Waste Storage Area	Radionuclides
	Building 5	Magnetic Fusion Energy	Former Radioactive Waste Storage Area	Radionuclides, chlorides, nitrites, organic compounds, solvents, acids
East Canyon (StW5)	Building 85	Hazardous Waste Handling Facility	Waste Accumulation Area	
	Building 69	Business Services, Materiel Management, Mailroom, and Purchasing	Former Drum Storage Area	Organic solvents and oils

2.4 Rationale for Monitoring Program Parameters

The general permit requires a discharger to monitor for certain specific substances (pH, total suspended solids (TSS), specific conductance, and total organic carbon (TOC) or oil and grease), specified parameters depending on SIC code, and also for “toxic chemicals and other pollutants that have a reasonable potential to be present in storm water discharge in significant quantities.” As stated in the Storm Water Pollution Prevention Plan, the major potential source of pollution to storm water runoff at Berkeley Lab would be use of chemicals in scientific experiments and industrial support operations. Most of these operations are conducted indoors in facilities with suitable safeguards to prevent pollution to the environment. Therefore, the most likely sources of pollution to storm water runoff would be unplanned releases from either indoor operations or outdoor facilities (including leakage from outdoor storage areas or equipment and deposition of airborne pollutants), or contamination from roadway traffic and parking lots, primarily oil and grease. Pathways include contaminated soil and groundwater, due to previous practices or connections to storm drains, and the aging storm drain system itself.

Due to the nature of operations at Berkeley Lab, there are many hazardous materials present on-site at any given time, and also a large number of waste chemicals classified as hazardous under RCRA, although these are generated in relatively small quantities. Care is taken to manage and store these materials appropriately and in compliance with all applicable federal, state, and local regulations and DOE policies. However, it is known that over the years of its existence at this site, i.e., since 1940, Berkeley Lab has experienced a number of spills, leaks, releases, and discharges of various kinds of contaminants to various media. Within the framework of a number of investigative programs, Berkeley Lab has undergone two separate RCRA Facility Assessments and has initiated a Site Restoration Project, including an Environmental Monitoring and Remediation Project and a detailed site characterization, which will enhance the understanding of existing conditions. Using available data from such investigations, a summary of contaminants of potential concern has been developed. These are materials which are either known to be present and stored outdoors on-site, have been detected in soil, air, or water on the site, or are known to have been released to or contaminated these media from various sources.

In Table 2-2, Waste Accumulation Areas (WAAs) and Drum Storage Areas (DSAs) on-site are listed, but almost all are now enclosed. Figure 2-6 shows the WAAs on-site; their number has been reduced to ten. It should be noted that since the contents of the WAAs vary from week to week, potential contaminants associated with the WAAs could only be given as a typical or representative inventory of the kinds of materials expected to be present. As a result of a project to consolidate bulk storage, the DSAs currently on-site are at buildings 16, 31, 58A, 62, 69, 76, and 79, and are all covered, are partially or fully enclosed, and have secondary containment. As such, their potential as a contaminant source has been greatly diminished. Current aboveground tanks are not listed for the same reason, since all are now double-walled with leak detection, and most also have secondary containment.

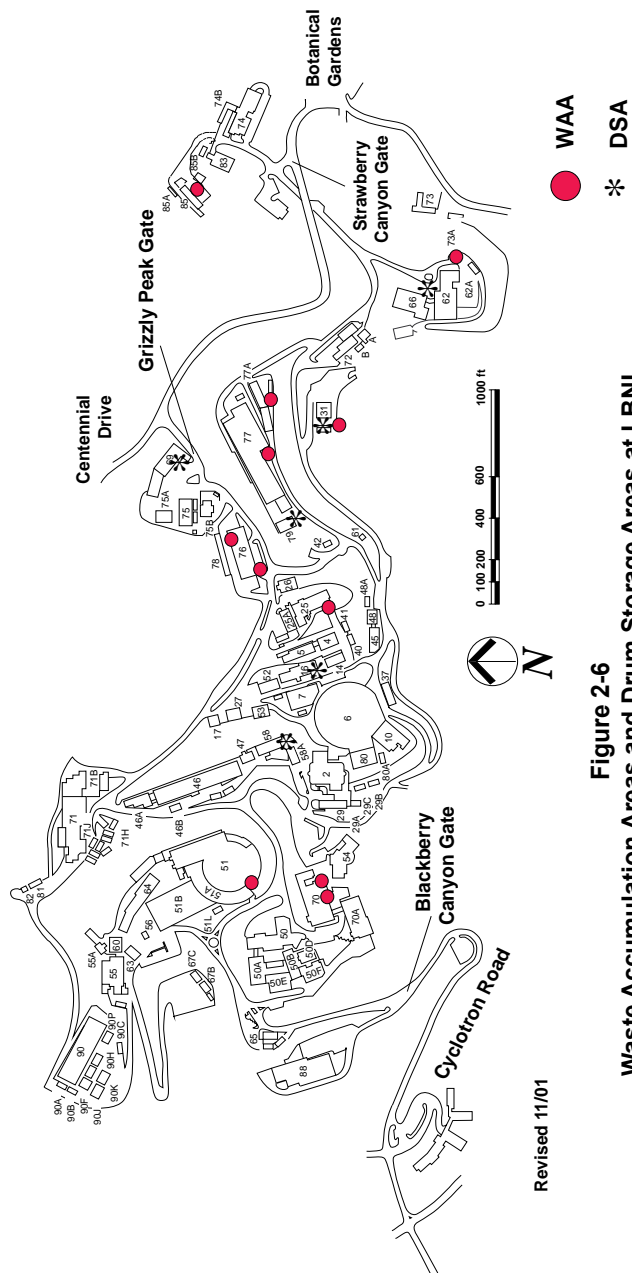


Figure 2-6
Waste Accumulation Areas and Drum Storage Areas at LBNL

Other sources, such as former underground or aboveground storage tanks, and materials which have been detected in soil, air, or water, or are known to have been released to or contaminated these media, have been compiled from various reports as described above in Section 2.3. The most complete and current report is the RCRA Facility Assessment (RFA) completed in September of 1992 by the site Environmental Restoration Program. Table 1-1 of that report, a summary of results, formed the basis for most of the information in the last two columns of Table 2-2. Only sources which were considered by the RFA to have high potential, past or present, for releases were included in Table 2-2. Full details are given in the body of the RFA.

Figure 2-7 is taken from an ongoing site environmental study which has divided the facility into various "study areas" and is attempting to characterize any known contamination in each area. As can be seen from the figure, historically there have been known releases in almost all areas of the facility. These were also considered in compiling Table 2-2 and thus in deciding which parameters would be targeted for the original monitoring program.

Additionally, the reissued General Permit adopted by the SWRCB on April 17, 1997 includes other analytical parameters which are now required, depending on a facility's SIC code (Table D of the Permit). Based on Berkeley Lab's self-characterization of relevant SIC codes, the following parameters will be included in the monitoring program:

- SIC Code 4953, Hazardous Waste Treatment, Storage, or Disposal
Facilities: NH₃, Mg, COD
- SIC Code 3499, Fabricated Metal Products: N+N, Fe, Al

SIC code 5093, Scrap Recycling Facilities, is no longer applicable to Berkeley Lab, since the salvage yard at building 42 was closed in 1998.

Cyanide will not be monitored for at StW5 even though Table D requires it. As noted below, Berkeley Lab has previously monitored the entire site for cyanide for several years. The lack of any significant results justifies no further monitoring for this parameter in accordance with Section B, 5.c.iii of the General Permit.

Taking into consideration the results of the monitoring program over the previous years, Berkeley Lab in 1995 eliminated sampling for VOCs and cyanide, and in 1996 eliminated sampling for TPH-gasoline and PCBs. The Board was duly notified by letters of these changes in the program according to Item B.6 of the 1991 General Permit, and the reason given was that these constituents had not been detected in significant quantities during three or four years, respectively, of sampling under the storm water program. For the same reason, starting with the 2001/2002 storm water season, the list of metals analyzed will be reduced to four. All others have not been detected in the last two years, or sometimes longer. Please see Table 3-1 or Appendix F for details.

Table 2-3 shows the analyses to be performed at each monitoring location, based on the materials which are potentially present and the results of previous years' sampling. Sampling and analysis will be conducted with these parameters as targets, as detailed below and in Sections 3.0 and 4.0 of this document. Analysis for tritium is included, but note that it is performed on a voluntary basis. Tritium does not meet the definition of a "pollutant" under the Clean Water Act, since it is a material which is regulated under the Atomic Energy Act (40 CFR 122.2).

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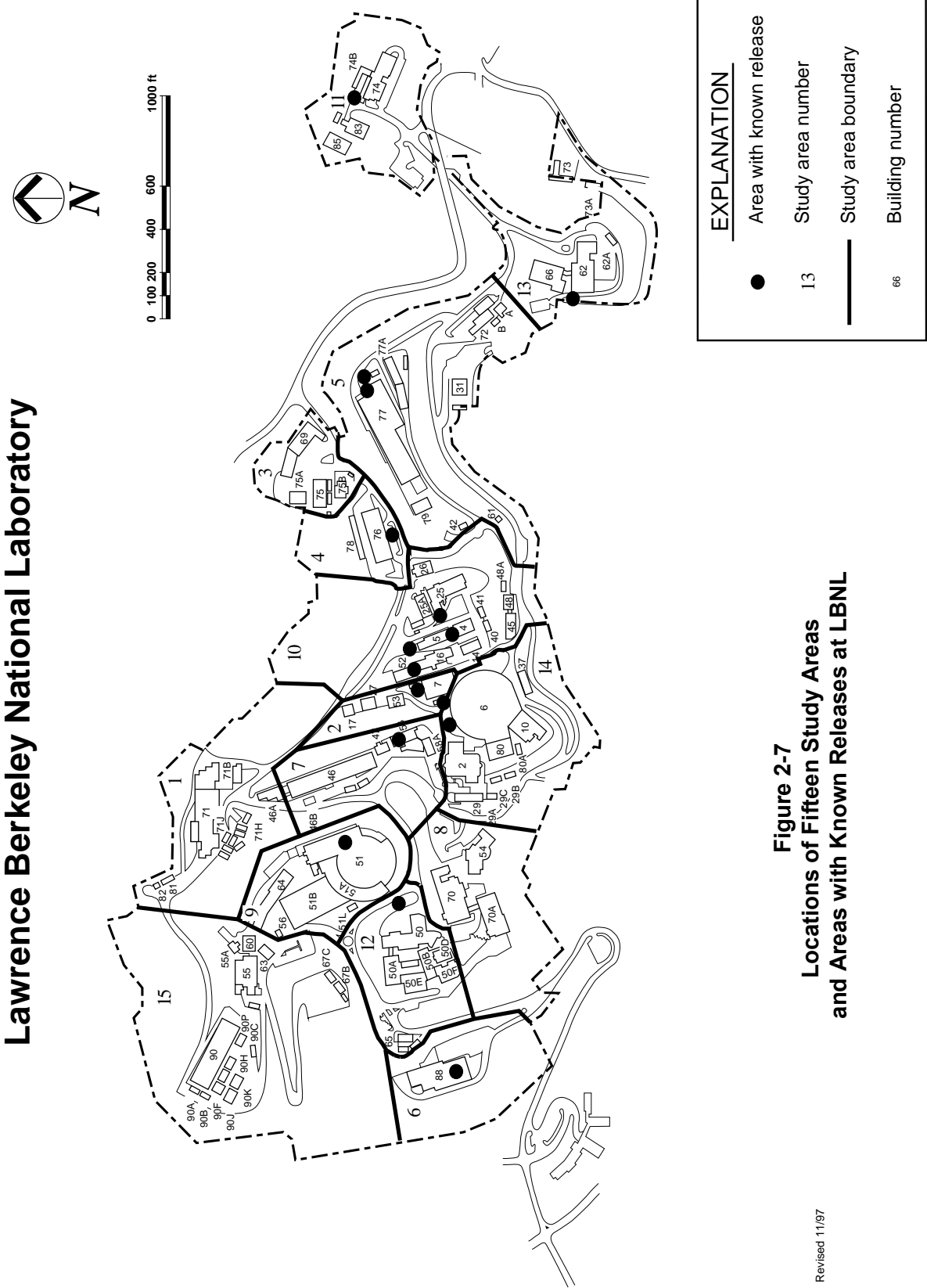


Figure 2-7
Locations of Fifteen Study Areas
and Areas with Known Releases at LBNL

Revised 11/97

Table 2-3
Analyses to be Performed for Monitoring Locations at Berkeley Lab

	Parameters of Concern ¹						
Monitoring Locations	Metals ² (Total)	TPH/ Diesel	Gross alpha & beta	Tritium	NH ₃	COD	N+N
StW 2	●	●	●	●		●	●
StW 3	●	●	●	●		●	●
StW 4	●	●	●	●		●	●
StW 5	●	●	●	●	●	●	●

¹ All samples are tested for pH, Total Suspended Solids (TSS), specific conductance, and Total Organic Carbon (TOC) or oil and grease.

² The General Permit requires analysis for total metals. In addition, Berkeley Lab had committed to analyzing one sample per year for dissolved metals, on the request of the City of Berkeley. This was done from 1996 to 2001 with inconclusive results, and was discontinued starting with the stormwater season of 2001/2002.

Table 2-4
Monitoring Program Design

	Task ¹		
Monitoring Locations	Observation of Authorized and Unauthorized Non-Storm Water Discharges (Quarterly) ²	Visual Observation of Storm Water Discharges (once per month, wet season)	Sampling ³
North Fork of Strawberry Creek Outlet (StW2)	●	●	●
Building 69 Inlet (StW3)	●	●	●
Chicken Creek Outlet (StW4)	●	●	●
East Canyon Outlet (StW5)	●	●	●

¹ Sampling and observation of storm water discharges must be preceded by three working days of dry weather and must occur during the first hour of the discharge. At Berkeley Lab, this may not be possible during the same event at all locations.

² Must be performed on days when there is no storm water discharge.

³ Consists of two storm water events per season, the first storm event of the season and one other.

2.5. Sampling Design

2.5.1 Sampling Approach

Taking into account the complexity of the site, the steep terrain, the equipment and number of personnel available for this program, and the unpredictability of significant storm water discharge, Berkeley Lab has designed a sampling program that makes every effort to capture representative discharge from the site. It is believed that the storm water discharged from the three current effluent monitoring locations fairly characterizes the quality and quantity of storm water discharged from the site. All current monitoring locations will be sampled twice during the storm water season for the required parameters of pH, total suspended solids (TSS), specific conductance, and total organic carbon (TOC) or oil and grease, and also for metals, TPH-diesel, gross alpha and beta emitters, tritium, COD, ammonia, and nitrate and nitrite as nitrogen. Berkeley Lab will evaluate these samples at the end of the year and revise the monitoring program accordingly.

It should be noted that a precise schedule of such sampling cannot be given. Details of the collection of grab samples, depending on the various targeted parameters, vary with each storm and with manpower resources. Sampling strategy is detailed in 2.5.2 below, while procedures for sampling can be found in Section 4.0 of this document.

Although most sampling is performed with automatic samplers, it may not always be possible to collect samples during the first hour at all sites for a single event. Thus it is noted that, due to logistical considerations, sampling may not necessarily be conducted for the same storm at all locations. An effort will be made to sample the inlet and outlet of the same basin during the same event to allow comparison of results.

In addition to sampling during the rainy season, Berkeley Lab will also carry out visual observations of storm water discharges once per month during the first hour of discharge at all monitoring locations. The form used to record such observations can be found in Appendix C.

As required by the General Permit, Berkeley Lab will also monitor the facility for the presence of unauthorized non-storm water discharges and visually observe the authorized non-storm water discharges. Such observations will occur quarterly, during daylight operating hours, on days with no storm water discharges. Quarters are understood to mean January-March, April-June, July-September, and October-December, and quarterly observations will be conducted within 6-18 weeks of each other. The form used to record such observations can be found in Appendix C. Table 2-4 provides an overview of the design for the entire storm water monitoring program.

2.5.2 Sampling Strategy

Automatic samplers are used at the four sites in the Strawberry Canyon and Blackberry Canyon basins described in Section 2.3 (StW2 through StW5). Samplers with liquid level actuators will be set up to initiate sampling when flow from runoff begins at the sites. Time-interval discrete samples will be collected every 7.5 minutes after there is flow at each site. Six liters of sample will be collected in the first hour of runoff if the runoff is continuous.

By sampling with automatic samplers at these sites it may be possible to collect runoff from storms beginning during off-duty hours. Although this is not required by the permit, it is one way in which it may be possible to fulfill the requirement of monitoring the first storm of the season. Another constraint is that sample collection is required only of storm water discharges that are preceded by at least three working days without storm water discharge. Berkeley Lab will make every effort to comply with all monitoring requirements as stated in the General Permit, and if unable to, will document in the Annual Report the reasons for any deviation from the required program.

Storm water discharge will lag behind rainfall, so that after 30 minutes of steady rain trained personnel will be ready to visit as many sites as possible to check for storm water runoff. A location will be dedicated for storage of the paperwork, sample containers, and equipment that will have to be ready on short notice for a monitoring run. "Ready Kits" (boxes or trays of containers, forms, and equipment needed for sampling and visual inspection) will be prepared ahead. See Appendix D for a list of the contents of a "Ready Kit." If it is necessary to mobilize for monitoring, a technician will be able to load a box into a vehicle and arrive on the site with all of the supplies necessary to conduct the work. A check list (such as the list in Appendix D) will be included with each kit or posted in the storage area with the kits. Vehicles will be available for these efforts on short notice.

3.0 ANALYTICAL METHODS

3.1 EPA Methods

The general permit states that all analyses must be conducted according to test procedures given under 40 CFR 136, unless otherwise specified in the permit or by the RWQCB. Berkeley Lab intends to comply with this requirement of the general permit and will thus specify certain analytical methods to be used for the pollutants of concern as documented in Section 2.0. These consist of EPA-approved methods and, as appropriate, any other methods approved and required by DOE for the constituents of concern. Table 3-1 shows the parameters and the corresponding analytical methods.

It is noted that Berkeley Lab is accredited to perform radiological analyses and routinely performs them for other waterborne radionuclide sampling done within the framework of the site Environmental Monitoring Program. Thus certain radiological analyses for this Storm Water Monitoring Program may be performed by Berkeley Lab's Radiation and Analytical Measurements Laboratory. QA splits and any other analyses will be carried out by a laboratory certified for such analyses by the State Department of Health Services. Sample collection and preservation will be in accordance with the above methods, and are further specified in Section 4.0 of this document.

Table 3-1**EPA Methods for Berkeley Lab Parameters Analyzed**

Parameter	EPA Method	Reporting Limits
TSS (total suspended solids)	160.2	2 mg/L
Specific Conductance	120.1	1 µmhos/cm
pH	150.1	- -
Oil and Grease	E1664	5 mg/L
Metals (aluminum, iron, magnesium, zinc)	200.7	*
TPH extractable (diesel, kerosene, motor oil)	8015/3510	200 µg/L
COD (chemical oxygen demand)	410.4	20.0 mg O/L
NH ₃ (ammonia as nitrogen)	350.1	.02 mg/L
N+N (nitrate and nitrite as nitrogen)	353.2	.1 mg/L
Gross alpha and beta	900	Alpha: 5 pCi/L Beta: 3.9 pCi/L
Tritium	906	200 pCi/L

* Varies according to metal from 0.01 to 1.0 mg/L.

4.0 SAMPLING PROGRAM

In order to determine the contaminants that exist in the storm water runoff, it is necessary to collect representative samples of the storm water runoff for analysis. Some measurements need to be taken in situ because the parameters to be measured will change substantially immediately after samples are collected.

4.1 Sampling Procedures

Sampling procedures will depend on the substances that are being analyzed and suspected influences that may interfere with the analyses. Samples will be collected from locations where significant storm water discharge from the site occurs. Samples must represent the quality and quantity of storm water discharged from the facility. Sample collection and preservation will be conducted in a manner which will eliminate or minimize changes in the sample which would interfere with the accurate measurement of the samples.

To this end, all sampling and sample preservation will be in accordance with the current edition of "Standard Methods for the Examination of Water and Wastewater" (American Public Health Association). All monitoring instruments and equipment will be calibrated and maintained in accordance with the manufacturers' specifications to ensure accurate measurements. Calibration and maintenance will be documented on the appropriate form, in accordance with standard procedures. All analyses will be conducted according to test procedures under 40 CFR Part 136, unless other test procedures have been specified by the Regional Board. Where 40 CFR 136 does not specify test procedures for a given parameter, EPA methods from "Procedures for the Examination of Water and Wastewater" or from "Standard Methods" have been chosen.

4.1.1 pH, EPA Method 150.1

Measurements of the pH of the storm waters will be taken in situ during grab sample collection. The pH will be measured electrometrically, using a pH meter which will be calibrated to the manufacturer's specifications at the beginning of each monitoring effort. The pH readings must be temperature-compensated, either manually or automatically according to manufacturer's specifications. The pH measurements will be recorded on the Sample Collection Form (see Appendix C) filled out during each sample collection.

4.1.2 Oil and Grease, EPA Method 1664 HEM

Grab samples will be collected at each site for oil and grease. Samples will be taken in clean, 1-liter, amber glass, glass-stoppered bottles previously washed with solvent and air-dried before use. Care will be taken that the sample is representative of the volume of water going past the sample site and that not too much or too little sample of the surface portion is collected. The surface will have a high concentration of oil and grease. The bottle will not be completely filled, to prevent loss of floating oils over the rim of the container. If storage of the samples of more than one day is inevitable, the sample will be preserved with 5 ml of 1+1 H₂SO₄ per liter of sample to inhibit bacterial activity.

4.1.3 Total Suspended Solids (TSS), EPA Method 160.2

Suspended solids will be determined by using a composite sample. Composite samples are more representative of the total solids being transported than a grab sample. To ensure that a homogeneous sample is used, the sample will be stirred or shaken well before an aliquot of a larger sample is collected. Sample containers will be clean so that no solids are contributed from them.

4.1.4 Specific Conductance, EPA Method 120.1

Specific conductance can be measured in situ with a self-contained conductance instrument or samples can be collected and sent to the laboratory with the other samples. If the measurements are taken in situ, the results will be recorded on the Sample Collection Form along with the grab sampling and visual observations. As with the pH meter, the conductivity meter will be calibrated in accordance with the manufacturer's specifications at the beginning of each monitoring effort. Containers used to collect samples for the laboratory will be free of substances which would cause free ions to be introduced into the sample.

4.1.5 Other Parameters

The following paragraphs describe the samples that will be collected at each site and explain the preservation techniques that are required to obtain the best analytical results from the sampling program. Sample containers that have been prepared for each procedure will be provided by the laboratory that is going to do the analyses. All samples will be packed in ice for transport and refrigerated to 4°C in storage until delivered to the laboratory. Cooling the samples to 4°C inhibits chemical and biological changes in the samples.

Procedure for EPA Method 8015, Diesel, Kerosene, Motor Oil

Grab samples will be collected in two 1-liter amber glass containers. The samples will be aerated as little as possible while filling, and the bottles will be filled up to the top so very little air is trapped in the bottle. These samples will be packed in ice for transport and refrigerated to 4°C in storage until delivered to the laboratory.

Procedure for EPA Method 200.7, Total or Dissolved Metals Analysis

A composite sample of one liter will be collected in a polyethylene container and cooled to 4° C.

Procedure for EPA Method 410.4, Chemical Oxygen Demand

A composite sample of 500 mL will be collected in a polyethylene container and cooled to 4°C.

Procedure for EPA Method 350.1, Ammonia as Nitrogen

A composite sample of 500 mL will be collected in a polyethylene container and cooled to 4°C.

Procedure for EPA Method 353.2, Nitrate and Nitrite as Nitrogen

A composite sample of 200 mL will be collected in a polyethylene container and cooled to 4°C.

Radiochemical Analysis, EPA Methods 900 and 906

For tritium collection, a 125 ml amber glass bottle will be used. For gross alpha and beta emitters, plastic reusable Nalgene 1 liter (1 quart) jars will be used for collection.

4.2 Sampling Locations

4.2.1 North Fork of Strawberry Creek Basin

North Fork of Strawberry Creek Outlet (Site ID: StW2)

Samples will be taken downstream of the first drop structure in the North Fork of Strawberry Creek. This site is behind Building 88, below the fence off Berkeley Lab property. A stairway for access and a sampling structure has been constructed at that point. Samples will be automatically collected using an ISCO sampler and liquid level actuator.

4.2.2 Strawberry Creek Basin

Chicken Creek Inlet Structure (Site ID: StW3)

The sampling location is a large manhole north of Building 69. Samples will be automatically collected using an ISCO sampler and liquid level actuator at the manhole invert after flows from the storm drains mix. Care will be taken to keep flows from the small lines on site out of the samples.

Chicken Creek Outlet (Site ID: StW4)

A sampling structure has been constructed on Chicken Creek at a point below the confluence of any site tributaries to it. Samples will be automatically collected using an ISCO sampler and liquid level actuator.

4.2.3 East Canyon Outlet (Site ID: StW5)

Samples will be taken at the drop structure on the east side of Cyclotron Road, adjacent to the overcrossing of Centennial Drive and just prior to the stream being culverted. An ISCO automatic sampler and liquid level actuator will collect the samples automatically.

4.3 Sampling Schedules

4.3.1 Visual Observations

During the wet season, visual observations will be made at all monitoring sites during at least one storm event per month. Visual observations are recorded on RWQCB Form 4 (see Appendix C). The visual observations will include the presence of floating and suspended materials, oil and grease, discolorations, turbidity, odor, and any observations which might indicate the source of any pollutants. In accordance with Section B.8 of the permit, if observations cannot be made because of adverse weather conditions, including lack of rain, a description of why the observations could not be made will be recorded and an explanation will be given in the Annual Report.

4.3.2 Collection and Analysis of Storm Water

Storm water will be collected and analyzed at the sample locations described in Section 4.2 for two storms each wet season, including, if possible, the first storm event. The storms must be preceded by at least three working days of dry weather. Samples will be collected during the first hour of runoff from a storm event, to the extent possible.

4.3.3 Dry Season Observations

Observation of authorized and unauthorized non-storm water discharges will be conducted quarterly for all drainage areas of the facility. Observation will include documentation of flows, discolorations, stains, sludges, odors, floating materials, and other abnormal conditions, as well as the source of any discharge. Dye tests, TV surveys, sampling and analysis, and validation of accurate piping schematics may be necessary to identify the source of any discharges. Observations will be recorded on RWQCB forms 2 and 3 provided for this purpose (see Appendix C). If non-storm water discharges are observed, an investigation will be conducted, and the SWPPP will be revised in accordance with Section A of the General Permit.

4.4 Sampling Equipment

ISCO 3700 samplers will be set up at the four sampling sites (StW2 through StW5) described in Section 4.2. The samplers will be equipped with plastic containers and liquid level sample actuator switches, and are connected to an AC power source. The samplers will be checked prior to forecasted or anticipated storms to make sure that they are operating properly and are ready to sample. Sample volume will be checked upon installation to assure that a proper volume will be collected upon sampler initiation. It may be necessary to take a water source along when the creeks and storm drains are not flowing. The sampler intake and the level actuator are placed so that flow at the site will actuate the sampler, collect representative samples, and not react to moisture or rainfall when the stream is not running.

4.4.1 Maintenance and Calibration

All maintenance will be carried out in accordance with EH&S Procedure 263, Storm Water and Surface Water Sampling Procedure. Equipment will be calibrated to manufacturers' specifications and checked to make sure that it is in good operating condition at least once before October 1st, and monthly thereafter to assure that the equipment will be working when a storm water discharge occurs.

The exception to this is conductivity meters and pH meters, which will be calibrated immediately prior to each monitoring session.

5.0 RECORDS AND REPORTS

5.1 Record Retention and Availability

Berkeley Lab will retain records of all storm water monitoring information and copies of the annual report (see below) and any other required records or reports for a period of at least five years from the date of the sample, observation, measurement, or report. These records are public documents, and will include the following:

- All data used to complete the NOI.
- The Record of Wet Season Visual Observations (see Appendix C), which includes date, place, and time of observation or measurement, the name of the individual who performed it, and observations as to discharge, source of discharge, and any corrective actions taken.
- The Record of Observation of Authorized and Unauthorized Non-Storm Water Discharges (see Appendix C), which includes date, time, and place of observation, the name of the individual performing the observation, and any corrective action taken.
- The date and place of site inspections, the individual who performed them, and any observations.
- Visual observation and sample collection exception records.
- Certifications, based on annual site inspections, that the facility is in compliance with the requirements of the General Permit and the SWPPP.
- Chain of custody forms (see Appendix C) for all samples taken and sent to a laboratory for analysis.
- All lab reports, including the date analyses were performed and the time they were initiated, the individual performing the analyses, method detection limits, and the analytical techniques or methods used and the results.
- Quality assurance/quality control results (see Section 7.0).
- All calibration and maintenance records of instruments used.
- All training certifications as described in Section 6.0 of this document.
- Records of any corrective actions and follow-up activities that resulted from visual observations.

All appropriate information will be retained in the offices of the Environmental Services Group. The records will be available for inspection upon request by a representative of the Regional Board or the local agency.

As a condition of the permit, Berkeley Lab will also maintain on-site a copy of the permit itself and make it available to operating personnel.

5.2 Reports

By July 1 of each year Berkeley Lab will submit an annual report in accordance with the reporting requirements of the general industrial storm water discharge permit. The report will include the following:

- A summary of visual observations and sampling results for the previous year, and an evaluation of them.
- Laboratory reports.
- The Annual Comprehensive Site Compliance Evaluation Report as specified in Section A.9 of the General Permit.
- Visual observation and sample collection exception reports, if any, and attendant documentation of all significant storm water discharge events.

The report will be signed and certified by the team leader of the Berkeley Lab Water Quality Program, in accordance with the signatory requirements (Provision 9) of the standard provisions of the general permit, and will contain the following certification:

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to ensure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Berkeley Lab will also comply with other reporting requirements pertaining to planned changes, anticipated noncompliance, compliance schedules, and noncompliance reporting, as described in Provision 11 of the Standard Provisions of the general permit.

Monitoring results and other relevant information contained in the annual report will also be published in the annual Berkeley Lab Site Environmental Report.

6.0 TRAINING

In order to ensure that monitoring is conducted by trained personnel, a training program is a necessary element of the quality control program discussed in Section 7.0 of this document. A curriculum has been developed and is available under separate cover. The Table of Contents from the curriculum can be found in Appendix E of this document as an indication of the subjects to be covered during training.

All personnel who will be carrying out observations and/or measurements under this SWMP will participate in the training program. Initial training occurred in September of 1992 prior to the startup of the storm water monitoring program, and was conducted by qualified individuals experienced in water quality monitoring and sampling, instrument maintenance and calibration, data management, and the regulatory framework. To the extent possible, training was conducted on the actual equipment that is to be used in sampling.

Training consisted of an introductory session followed by two four-hour classroom training periods. A test was administered at the end of the training, and, upon successful completion of the test, individuals were certified to participate in monitoring and sampling activities. Training records were placed in a file kept by the Team Leader and also became part of the records retained as described in Section 5.0 of this document.

Individuals whose duties will include monitoring and sampling subsequent to the initial training will be provided with the curriculum for self-study and given on-the-job training by personnel who have been trained and certified in this training program. They may also be tested and certified as described above. As of the date of this revision of the SWMP, one sampling technician has retired, and one new employee was hired as a replacement. This employee brought previous knowledge to the workplace, and was tested by training program materials and subsequently certified. As conditions or parameters change, or the scope of operations increases, additional training may be designed and implemented.

7.0 QA/QC AND PROGRAM EVALUATION

7.1 Purpose

This SWMP will become a part of the overall Environmental Monitoring Program at Berkeley Lab, which is based on DOE Order 5400.1 and draft DOE/EH-0173T. In keeping with the objectives of DOE Order 5400.1 pertaining to compliance, minimization of risks to the public and the environment, and the conducting of environmental monitoring to identify and evaluate the effects of DOE activities, Environmental Services personnel will exercise oversight over this program by monitoring the completion of the following quality assurance/quality control activities:

- All monitoring is conducted by trained personnel. See Section 6.0, Training Program.
- All personnel are familiar with the SWMP. A statement certifying that each staff member who will be conducting sampling has read and is familiar with the SWMP will become part of the individual's training record.
- Records are maintained certifying that all instruments are calibrated and maintained in accordance with manufacturers' instructions and EH&S procedures.
- Only state-certified laboratories with approved quality assurance programs for the analysis of samples are used, and such analysis is documented by chain of custody and laboratory reports.
- Quality Control is carried out in accordance with EH&S Procedure 263, Storm water and Surface Water Sampling Procedure.
- Verification of data quality is carried out in accordance with EH&S Procedure 252, Data Quality Objectives and Assessment.
- Procedures are initiated by which management will review activities and confirm that all elements of the SWMP have been carried out (see Section 1.4, Implementation Activities).

The purpose of periodic evaluation is to monitor, in an ongoing and systematic fashion, the effectiveness of the SWMP in meeting the objectives stated in the general permit and repeated in Section 1.0 of this document. The main goal of the SWMP is to produce accurate, representative data on the amount of contaminants, if any, discharged by Berkeley Lab in its storm water runoff, and, by using this data, to demonstrate a reduction in such contaminants due to measures and practices described in the SWPPP.

7.2 Procedures and Schedules

Upon receipt of the laboratory results, the Environmental Services Quality Coordinator will review them for completeness and any reduction/increase in any contaminants determined to be present. The Team Leader will validate them and address any unusual or unexpected results. During the dry season the only activity will be the observation of non-storm water discharge, if any. During the wet season both the Record of Observation and the results of any sampling analyses will need to be reviewed. The Quality Coordinator will also review the monitoring design (Table 2-4) to assure that all activities which need to be conducted are in fact carried out. Since rainfall and significant storm water discharge are unpredictable, and sampling cannot be scheduled at regular intervals, particular emphasis must be placed upon ensuring that two storm events per season are monitored at all locations which are slated to be monitored. During the dry season, activity should be reviewed once

per month to assure that observations are completed, since there will be no sampling results. The Quality Coordinator will periodically report the status of storm water monitoring to the team leader. Any anomalies in monitoring results must be reported immediately. The team leader will also monitor the status of the program by reviewing the data base once per month at a minimum.

The records of observations and results of analyses become part of the permanent record and provide the basis for the annual report which is due to the RWQCB on July 1 of each year (see Section 5.0). The periodic program evaluation is the basis for the annual evaluation of the SWMP also found in the annual report, and for any revisions or amendments to the SWMP. In accordance with the permit, for example, if toxic chemicals or other pollutants are not detected in significant quantities after two consecutive sampling events, that toxic chemical or pollutant may be eliminated from future sampling events.

To be effective, the SWMP must collect and present accurate, representative data which characterize Berkeley Lab's storm water runoff. Evaluation of the SWMP should demonstrate that it is in fact carrying out this goal. The ultimate goal is to document the achievement of a reduction in any contaminants which may at first be present in that runoff. By evaluating and keeping track of the results of various analyses, it will become clear which areas are producing contaminants and which areas are improving by reducing contaminants in storm water runoff. If the levels of contaminants decrease with each succeeding analysis, this will clearly demonstrate that both the SWPPP and the SWMP are fulfilling their respective functions, the former by achieving the reduction, if not the elimination, of any contaminants through Best Management Practices (BMPs), and the latter by documenting that achievement.

Appendix A

Record of Revisions

RECORD OF REVISIONS

Number	Description	Section	Date	Initials
Rev. 0	Original Document	All	1/93	REL
Rev. 1	General Revision	All	3/97	REL
Rev. 2	General Revision to meet requirements of reissued General Permit	All	6/97	REL
Rev. 3	General Revision	All	12/01	REL

Appendix B

List of Acronyms

LIST OF ACRONYMS

BMPs	Best Management Practices
BTEX	Benzene, Toluene, Ethylbenzene, Xylene
CFR	Code of Federal Regulations
DOE	Department of Energy
DSA	Drum Storage Area
EPA	Environmental Protection Agency
GC/MS	Gas Chromatography/Mass Spectroscopy
Berkeley Lab	Lawrence Berkeley National Laboratory
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
PCBs	Polychlorinated Biphenyls
QA/QC	Quality Assurance/Quality Control
RCRA	Resource Conservation and Recovery Act
RWQCB	Regional Water Quality Control Board
SIC	Standard Industrial Classification
SWMP	Storm Water Monitoring Plan
SWPPP	Storm Water Pollution Prevention Plan
SWRCB	State Water Resources Control Board
TOC	Total Organic Carbon
TPH	Total Petroleum Hydrocarbons
TSS	Total Suspended Solids
UST	Underground Storage Tank
WAA	Waste Accumulation Area

Appendix C

Forms and Records

Appendix D

Contents of a Ready Kit

CONTENTS OF A READY KIT

pH meter (calibrated)

Conductivity meter (calibrated)

Nephelometer (calibrated)

Sample containers (ISCO bottoms)

Ice or Blue Ice

Sample grabber (pole with containers)

Forms, pencils, clip board

Thermometer

VOA vials for five composite sites

Oil and grease sample bottles for five composite sites

Container for equipment, easy to carry over rough terrain

Other items needed:

Rain gear

Boots

Vehicle

Disposable surgical-type gloves

Plastic trash bag

Sample collection tray

Safety glasses or goggles

Cooler chest

Prepared sample labels

Kimwipes[™] or tissues

Appendix E

Training Curriculum Table of Contents

Training Curriculum Table of Contents

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Appendices

A. Selected Sections from the *EPA Guidance Manual for the Preparation of NPDES Permit Applications for Storm Water Discharges Associated with Industrial Activity*

B. Certification of Training

C. Tests

Appendix F

Changes in Monitoring Parameters

**(see also Section 2.4, Rationale for Monitoring Parameters,
for narrative details)**

Table 2-3
Analyses to be Performed for Monitoring Locations at Berkeley Lab

	Parameters of Concern ¹						
Monitoring Locations	Metals ² (Total)	TPH/ Diesel	Gross alpha & beta	Tritium	NH ₃	COD	N+N
StW 1	●	●	●	●		●	●
StW 2	●	●	●	●		●	●
StW 3	●	●	●	●		●	●
StW 4	●	●	●	●		●	●
StW 5	●	●	●	●	●	●	●

¹ All samples are tested for pH, Total Suspended Solids (TSS), specific conductance, and Total Organic Carbon (TOC) or oil and grease.

² The General Permit requires analysis for total metals. In addition, Berkeley Lab has committed to analyzing one sample per year for dissolved metals, on the request of the local administering agency. Metals will include aluminum, iron, and magnesium.